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FLYTRAPS AND THEIR OPERATION.

By F. C. BISHOPP, *Entomological Assistant.*

INTRODUCTION.

Flytraps have a distinct place in the control of the house fly and other noxious fly species. There is a general tendency, however, for those engaged in combating flies to put too much dependence on the flytrap as a method of abating the nuisance. It should be borne in mind that flytrapping is only supplementary to other methods of control, most notable of which is the prevention of breeding either by completely disposing of breeding places or by treating the breeding material with chemicals.[1]

It may be said that there are two main ways in which flytraps are valuable: (1) Catching flies which come to clean premises from other places which are insanitary and (2) capturing those flies which invariably escape in greater or less numbers the other means of destruction which may be practiced. Furthermore, the number of flies caught in traps serves as an index of the effectiveness of campaigns against breeding places.

[1] Results obtained in experiments with the use of chemicals against fly larvæ in manure are presented in Bulletins Nos. 118 and 245 of the Department of Agriculture. The biology of the house fly and the various methods of control are discussed in Farmers' Bulletin 679.

NOTE.—This bulletin is intended to give directions for the use of a supplementary means of controlling flies; it is adapted to all parts of the United States.

Fly trapping should begin early in spring if it is to be of greatest value. Although comparatively few flies are caught in the early spring, their destruction means *the prevention of the development of myriads of flies by midsummer.*

KINDS OF FLIES CAUGHT.

The various species of flies which are commonly annoying about habitations or where foodstuffs are being prepared may be divided roughly into two classes: (1) Those which breed in animal matter, consisting mainly of the so-called "blowflies"; and (2) those which breed in vegetable as well as in animal matter. In the latter group the house fly is by far the most important. The stable fly is strictly a vegetable breeder, as are also certain other species which occasionally come into houses and may in rare cases contaminate foodstuffs. The stable fly, which breeds in manure or decaying vegetable matter, and the horn fly, which breeds in cow manure, are blood-sucking species, and can be caught in ordinary flytraps in comparatively small numbers only. The kind of flies caught depends to a considerable extent on the material used for bait. In general the house fly and other species which breed in vegetable matter are attracted to vegetable substances, while the blowflies will come most readily to animal matter. This rule, of course, is not absolute, as flies are less restricted in feeding than in breeding habits, and, as is well known, the house fly is attracted to a greater or less extent to any moist material, especially if it has an odor.

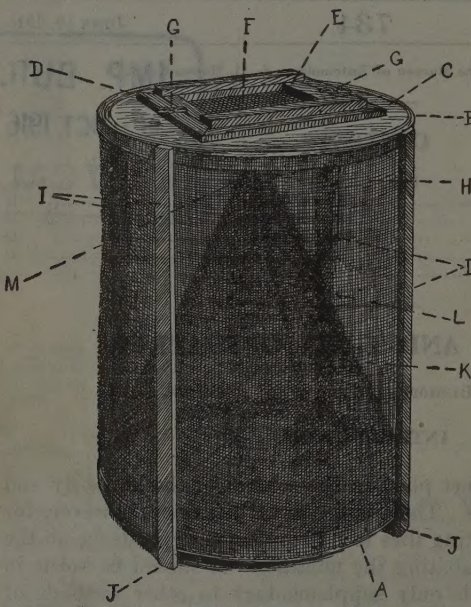

FIG. 1.—Conical hoop flytrap; side view. *A*, Hoops forming frame at bottom. *B*, Hoops forming frame at top. *C*, Top of trap made of barrel head. *D*, Strips around door. *E*, Door frame. *F*, Screen on door. *G*, Buttons holding door. *H*, Screen on outside of trap. *I*, Strips on side of trap between hoops. *J*, Tips of these strips projecting to form legs. *K*, Cone. *L*, United edges of screen forming cone. *M*, Aperture at apex of cone. (Author's illustration.)

TYPES OF TRAPS.

The same general principle is involved in nearly all flytraps in use, though superficially they may appear quite different. The flies are attracted into a cage, as it were, by going through a passage the entrance of which is large and the exit small, so there is little chance of the flies, once in, finding their way out again. This principle is modified to fit different conditions. For instance, the window trap, devised by Prof. C. F. Hodge, catches the flies as they endeavor to enter or leave a building; the garbage-can trap, for which Prof. Hodge is also to be credited, catches the flies that have entered garbage cans; and the manure-box trap retains the flies bred from infested manure put into the box.

The attractant used to induce flies to enter traps may consist of (1) food, as in baited traps; (2) odors, as in window traps placed in windows from which odors are emitted; and (3) light, as in traps on manure boxes. Of course light is an important factor in the success of all traps, for, as is well known, flies have a marked tendency to go toward the light, and they usually enter the trap by flying toward the light after having been attracted beneath it by bait or after entering a room in search of food.

CONICAL TRAPS.

A number of traps of this general type are on the market, but most of these are of small size. Nearly all are constructed with a dome instead of a cone, and on this account the catching power is reduced about one-third. Moreover, the farmer, dairyman, or anyone with a few tools can construct traps at a small fraction of the sale price of ready-made ones.

THE CONICAL HOOP TRAP.

A trap which appears from extensive tests made by Mr. E. W. Laake and the author to be best for effective trapping, durability, ease of construction and repair, and cheapness may be made as follows:

The trap consists essentially of a screen cylinder with a frame made of barrel hoops, in the bottom of which is inserted a screen cone. The height of the cylinder is 24 inches, the diameter 18 inches, and the cone is 22 inches high, and 18 inches in diameter at the base. Material necessary for this trap consists of four new or secondhand wooden barrel hoops, one barrel head, four laths, 10 feet of strips 1 to 1½ inches wide by one-half inch thick (portions of old boxes will suffice), 61 linear inches of 12 or 14 mesh galvanized screening 24 inches wide for the sides of the trap and 41 inches of screening 26 inches wide for the cone and door, an ounce of carpet tacks, and two turn-buttons, which may be made of wood. The total cost of the material for this trap, if all is bought new at retail prices, is about 65 cents. In practically all cases, however, the barrel hoops, barrel head, lath, and strips can be obtained without expense. This

would reduce the cost to that of the wire and tacks, which would be 45 cents. If a larger number of traps are constructed at one time the cost is considerably reduced.

One of these traps is illustrated in figures 1 and 2. In constructing the trap two of the hoops are bent in a circle (18 inches in diameter on the inside), and nailed together, the ends being trimmed to give a close fit. These form the bottom of the frame (*A*), and the other two, prepared in a similar way, the top (*B*). The top (*C*) of the trap is made of an ordinary barrel head with the bevel edge sawed off sufficiently to cause the head to fit closely in the hoops and allow

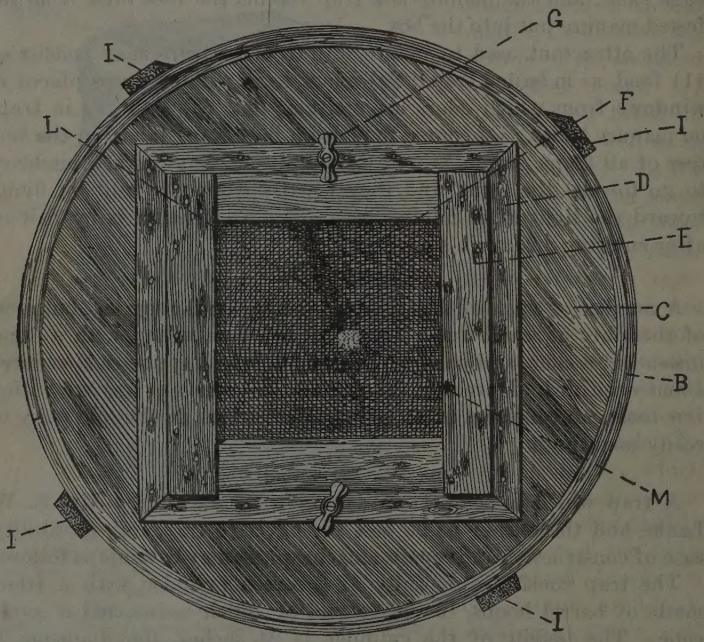

FIG. 2.—Conical hoop flytrap; top view. Letters designate parts as in figure 1. (Author's illustration.)

secure nailing. A square, 10 inches on the side, is cut out of the center of the top to form a door. The portions of the top (barrel head) are held together by inch strips (*D*) placed around the opening one-half inch from the edge to form a jamb for the door. The door consists of a narrow frame (*E*) covered with screen (*F*) well fitted to the trap and held in place (not hinged) by buttons (*G*). The top is then nailed in the upper hoops and the sides (*H*) formed by closely tacking screen wire on the outside of the hoops. Four laths (*I*) (or light strips) are nailed to the hoops on the outside of the trap to act as supports between the hoops, and the ends are allowed to pro-

ject 1 inch at the bottom to form legs (*J*). The cone (*K*) is cut from the screen and either sewed with fine wire or soldered where the edges meet at (*L*). The apex of the cone is then cut off to give an aperture (*M*) 1 inch in diameter. It is then inserted in the trap and closely tacked to the hoop around the base.

The construction of a cone of any given height or diameter is quite simple if the following method be observed. It is best to cut a pattern from a large piece of heavy paper, cardboard, or tin. Figure 3 illustrates the method of laying out a cone of the proper dimensions for the above trap. An ordinary square is placed on the material from which the pattern is to be cut; a distance (22 inches) equal to the height of the cone is laid off on one leg of the square at *A*, and a distance (9 inches) equal to one-half of the diameter of the base of the cone is laid off on the other leg at *B*.

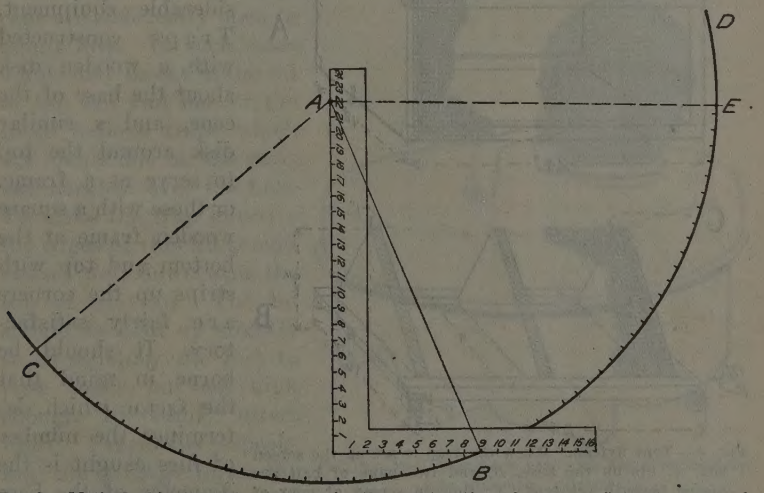

FIG. 3.—Method of laying out a pattern for the construction of a cone. Cut out on curved line *C* to *E* and on dotted lines from *A* to *C* and *A* to *E*. (Author's illustration.)

and a line is drawn between the points *A* and *B*. With the distance between these points as a radius and with the point *A* as a center, the portion of a circle *C D*, is drawn. With a pair of dividers, the legs of which are set 1 inch apart, or with the square, lay off as many inches on the arc *C D*, starting at *C*, as there are inches around the base of the cone, which in this case is about 56½ inches, reaching nearly to the point *E*. Then add one-half inch for the lapping of the edges of the cone, and one-half inch which is taken up when the cone is tacked in, thus making a total distance from *C* to *E* of 57½ inches. Draw a line from *A* to *C* and another from *A* to *E*, and cut out the pattern on these lines and on the arc from *C* to *E*, as shown in figure 3. The edges *AC* and *AE* are then brought together, lapped one-half inch and sewed with wire or soldered. After the aperture

of the cone is formed by cutting off the apex, as previously described, it is ready for insertion in the trap.

In order to figure the distance around the base of a cone of any given diameter, multiply the diameter by 3.1416 or $3\frac{1}{7}$.

The height of the legs of the trap, the height of the cone, and the size of the aperture in the top of the cone, each are of importance in securing the greatest efficiency.

OTHER FORMS OF CONICAL TRAPS.

Conical traps with steel frames are satisfactory, but they are less easily rescreened and it is more difficult to keep the lids closely fitted. These, of course, can be constructed only by shops with considerable equipment. Traps constructed with a wooden disk about the base of the cone, and a similar disk around the top to serve as a frame, or those with a square wooden frame at the bottom and top with strips up the corners are fairly satisfactory. It should be borne in mind that the factor which determines the number of flies caught is the diameter of the base of the cone, if other things are equal. Therefore the space taken up by the wooden framework is largely wasted, and if it is too wide it will have a deterrent effect on the flies which come toward the bait. For this reason it is advisable that the wood around the base of the cone should be as narrow as consistent with strength—usually about 3 inches.

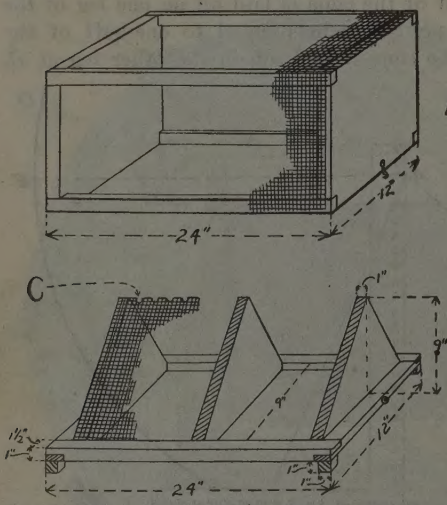

FIG. 4.—Tent flytrap. When the trap is set up the screen box, *A*, fits on the base, *B*, and two pans of bait are placed beneath the tent. *C*, Hole in screen at apex of tent. (Original.)

Under no condition should the sides or top of the trap be of solid material, as the elimination of light from the top or sides has been found to decrease the catch from 50 to 75 per cent.

TENT TRAPS.

The tent form of trap has been widely advocated in this country, but recent experiments indicate that it is much less efficient than the

cone trap, and usually as difficult to construct and almost as expensive. The size of these traps may vary considerably, but one constructed according to the dimensions given in figure 4 will be found most convenient. The height of the tent should be about equal to the width of the base, and the holes (*C*) along the apex of the tent should be one-half to three-fourths of an inch in diameter and 1 inch apart. The box (*A*) should be provided with hooks to pass through eyes on the base (*B*). Small blocks 1 inch thick are nailed beneath the corners of the tent frame to serve as legs.

GARBAGE-CAN TRAPS.

As previously mentioned, Prof. Hodge has adapted the cone trap to use on the lids of garbage cans. It is not advisable to use this trap except where garbage cans are sufficiently open to admit flies. In such cases a hole may be cut in the lid of the can and one of the small balloon traps which are obtainable on the market attached over the hole. To make the trap effective the edges of this lid should extend well down over the top of the can. The lid should be held up slightly so as to allow the flies to pass under, but not high enough to admit direct light. Practically speaking, the garbage forms the bait for this trap, and when inside the can the flies are attracted to the light admitted through the trap. It is really advisable to have the garbage cans fly proof, so as to prevent danger of fly breeding within them rather than to depend on traps on the lids, which necessarily allow odors to escape. A garbage can with a trap attached is illustrated in figure 5.

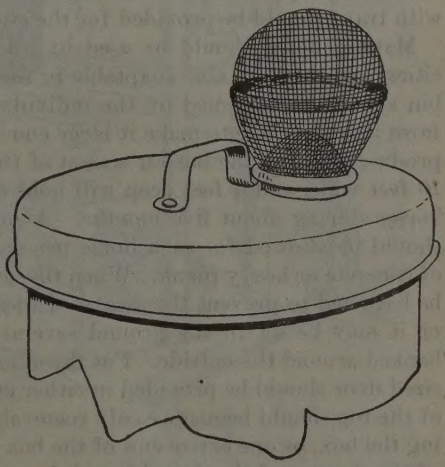

FIG. 5.—Top of garbage can with small balloon flytrap attached. (Original.)

MANURE-BOX TRAPS.

Manure pits or boxes are desirable for the temporary storage of manure, especially in towns and cities. These have been widely advocated, but the difficulty has been that manure often becomes infested before it is put into them, and flies frequently breed out before the boxes are emptied and often escape through the cracks. To obviate these difficulties a manure box or pit, with a modified

tent trap or cone trap attached, is desirable. Mr. Arthur Swaim, of Florida, has devised a form of manure trap consisting of a series of screen tents with exit holes along the ridges of these, over which is a screen box. The latter retains the flies as they pass through the holes in the tents. The entire trap is removable.

In order to retain the fertilizing value of manure to the greatest extent it is advisable to exclude the air from it as much as possible and to protect it from the leaching action of rains. This being the case, there is really no necessity for covering a large portion of the top of the box with a trap, but merely to have holes large enough to attract flies to the light, and cover these holes with ordinary conical traps, with the legs cut off, so the bottom of the trap will fit closely to the box. The same arrangement can be made where manure is kept in a pit. In large bins two or more holes covered with traps should be provided for the escape of the flies.

Manure boxes should be used by all stock owners in towns and cities, and they are also adaptable to farms. The size of the manure bin should be governed by the individual needs, but for use on the farm it is desirable to make it large enough to hold all of the manure produced during the busiest season of the year. A box 14 feet long, 10 feet wide, and 4 feet deep will hold the manure produced by two horses during about five months. About 2 cubic feet of box space should be allowed for each horse per day. The bin should be made of concrete or heavy plank. When the latter is used the cracks should be battened to prevent the escape of flies. The bin may have a floor or it may be set in the ground several inches and the dirt closely banked around the outside. For the admission of the manure a good-sized door should be provided in either end of a large bin. A portion of the top should be made easily removable for convenience in emptying the box, or one entire end of the box may be hinged. On account of the danger of the door being left open through carelessness, it is advisable to arrange a lift door which can be opened by placing the foot on a treadle as the manure is shoveled in. The door should be heavy enough to close automatically when the treadle is released. A manure bin with flytrap attached is shown in figure 6.

Attention is directed to a maggot trap devised by Mr. R. H. Hutchison, as described in Bulletin No. 200 of the Department of Agriculture. Where large quantities of manure are produced on a farm this method of storing the manure on a platform and trapping the maggots which breed out may be more convenient than the manure bin.

WINDOW TRAPS.

Prof. C. F. Hodge has designed a trap which is really a modified tent trap adapted to use in a window. This trap is constructed so

as to catch the flies as they enter or leave through the window. It is adaptable to barns which are fairly free from cracks or other places where flies may enter. It may also be used on windows of buildings where foodstuffs are prepared and where flies endeavor to enter through the windows or escape after having gained entrance through other passageways. All openings not provided with traps should be closely screened, and on large buildings traps may be installed in every third window.

This trap is essentially a screen box closely fitted to the frame of

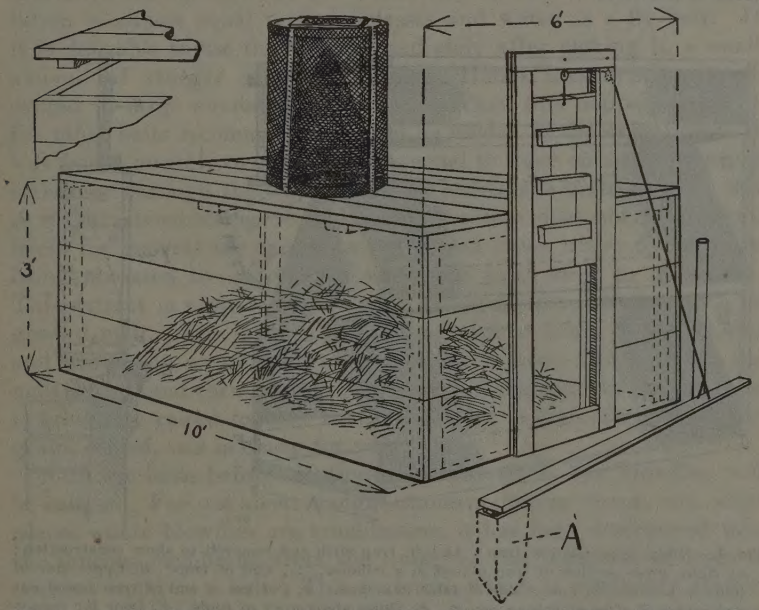

FIG. 6.—Use of flytrap in connection with manure bin. *A*, Block of wood set in ground to which lever raising door is hinged. (Original.)

a window (see fig. 7). The thickness of the box at *A* should be about 12 inches. Instead of the screen running straight down over the box on either side it is folded inward nearly to the center of the frame in V-shaped folds running longitudinally across the window. One, two, or even more folds may be made in the screen on either side. The upper side of the fold *B* should extend toward the center almost at right angles with the side of the trap, that is, parallel with the top and bottom; and the lower side *C* should slant downward as shown in the drawing. The sides of the frame may be cut out at the proper angle and the pieces *D* returned after the screen has been tacked along the edges. Along the apex (inner edge) of each fold is

punched a series of holes *E* about one-half inch in diameter and 1 inch apart. The apices of the folds on either side of the window should not be directly opposite. A narrow door *F* opening downward on hinges should be made on one side of the trap at the bottom for removal of the dead flies. The entire trap is fastened to the window by hooks so that it may be readily taken off. An additional trapping feature may be added by providing a tent trap fitted in the bottom of the box. A narrow slit is left along the base to allow the flies to enter beneath the tent. Bait may be placed under the tent to attract the flies.

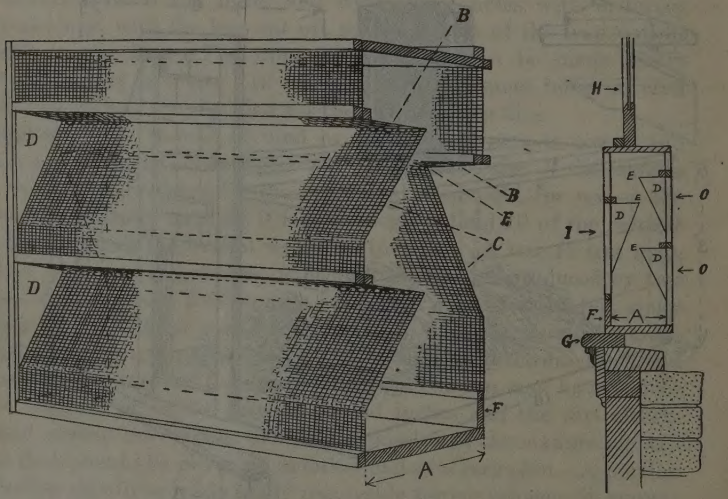

FIG. 7.—Hodge type window trap. At left, trap with end removed to show construction; at right, cross section of trap placed in a window. *A*, End of trap. *B*, Upper side of folds in screen. *C*, Lower side of folds in screen. *D*, Portion of end of trap sawed out and returned after attaching screen. *E*, Holes along apex of folds. *F*, Door for removing dead flies. *G*, Window sill. *H*, Upper window sash. *I*, Inside entrance for flies. *O*, Outside entrances. (Author's illustration.)

It has been found that the use of these window traps will aid in protecting animals in barns from stable flies and mosquitoes, and in some cases horseflies and other noxious species are caught.

BAITS FOR TRAPS.

The question of selecting the best bait for flies is an important one. As has been indicated, the kind of bait used should be governed by the species of flies which it is desired to destroy. For the most part it is the house fly which it is desired to catch, and for this insect waste beer is preeminently the best bait. In some cases

it can be procured without charge and in others it is sold at from 5 to 10 cents per gallon. On dairy farms, probably milk is the next best bait, considering its convenience. The tests indicate that milk is not more than one-third as effective as beer and rather less so than a mixture of cheap molasses and water. This mixture is prepared by adding 3 parts of water to 1 part of "black-strap" molasses and allowing it to ferment for a day or two. All baits, milk, beer, etc., are much more attractive during active fermentation. Sirup made by dissolving 1 part of ordinary brown sugar in 4 parts of water and allowing the mixture to stand a day or two to induce fermentation is almost equal to the molasses and water as a fly bait. If it is desirable to use the sirup immediately after making it, a small amount of vinegar should be added. Honey bees are sometimes caught in large numbers at this bait. When this happens some of the other baits recommended should be used. In the experiments it was found possible to secure catches equal to those obtained by using stale beer through the employment of homemade malt extract; this is slightly troublesome to make and therefore does not recommend itself for general use except in towns and cities where flytraps are being operated by individuals who give much time to this work. This extract is prepared by using 1 gallon of water to 2 pounds of ground malt. The latter may be purchased at about $1 per bushel and ground in a coffee mill. The water is heated to 135° F., the malt added, and then during a period of 45 minutes the temperature is gradually raised to 160° F. The extract is then strained off the grain, cooled, and is ready for use.

With the baits before mentioned comparatively few blowflies will be caught. For use about slaughterhouses, butcher shops, and other places where blowflies are troublesome, it has been determined that the mucous membrane from the lining of the intestines of hogs is without equal as a bait. This material, which is commonly spoken of as "gut slime," can be obtained from packing houses where sausage casings are prepared. The offensive odor of this bait renders its use undesirable near materials intended for human consumption. Another packing-house product known as blood tankage is a good fly bait when used with beer. This combination results in the capture of a large percentage of house flies. Still better results are obtainable by using "gut slime" in combination with beer. Where these materials are not obtainable fairly good catches will result from the use of fish scraps or meat scraps. With any of these baits the catches will be found not to be entirely meat-infesting flies, as actual counts have shown that the precentage of house flies in traps over such baits ranges from 45 to 75.

Overripe or fermenting fruit, such as bananas, crushed and placed in the bait pans sometimes gives satisfactory results. A combina-

tion of overripe bananas with milk is much more attractive than either one used separately. A considerable number of blow-flies as well as house flies are attracted to such baits.

BAIT CONTAINERS.

The size of the bait container in relation to the size of the trap is a very important consideration. It has been found that a small pan or deep pan of bait set in the center under a trap will catch only a small fraction of the number of flies secured by using larger, shallow containers. The best and most convenient pan for baits is a shallow circular tin, such as the cover of a lard bucket. Its diameter should be about 4 inches less than that of the base of the trap, thus bringing the edge within 2 inches of the outside edge of the trap. The catch can be increased slightly by placing a piece of sponge or a few chips in the center of the bait pan to provide additional surface upon which the flies may alight. The same kind of pans for bait may be used under tent traps. Two or more pans should be used, according to the length of the trap.

CARE AND LOCATION OF TRAPS.

In many cases fly trapping has been rendered ineffectual by the fact that the traps were not properly cared for. In setting traps a location should be chosen where flies naturally congregate. This is usually on the sunny side of a building out of the wind. It is exceedingly important that the bait containers be kept well filled. This usually requires attention every other day. The bait pans should be washed out at rather frequent intervals. This gives a larger catch and avoids the danger of flies breeding in the material used for bait. Further, it should be borne in mind that traps can not be operated successfully throughout the season without emptying them. Where flies are abundant and the bait pans are properly attended to the traps should be emptied at weekly intervals. Where flies become piled high against the side of the cone the catching power of the trap is considerably reduced. The destruction of the flies is best accomplished by immersing the trap in hot water, or still better, where a tight barrel is at hand place a few live coals in a pan on the ground, scatter two tablespoonfuls of sulphur over them, place the trap over the coals, and turn the barrel over the trap. All of the flies will be rendered motionless in about five minutes. They may then be killed by using hot water, throwing them into a fire, or burying them.

STICKY FLY PAPERS.

Sticky fly papers are of some value in destroying flies which have gained access to houses, but they have marked limitations and numerous objectionable features. For use out of doors, traps are much more effective and economical.

Dr. Crumbine, of the Kansas State Board of Health, gives the following method for preparing fly paper:

"Take 2 pounds of rosin and 1 pint of castor oil, heat together until it looks like molasses. Take an ordinary paint brush and smear while hot on any kind of paper—an old newspaper is good—and place several about the room. A dozen of these may be made at a cost of 1 cent."

POISONED BAITS.

The question of destruction of flies with poisons is somewhat out of place here, but the close relationship of poisoned baits to trapping warrants a brief statement.

Probably the best poisoned bait for house flies is formaldehyde in milk used at the rate of about two tablespoonfuls of formaldehyde to a pint of a mixture of equal parts of milk and water. This is placed in flat dishes in places frequented by flies. A piece of bread or a sponge in the dish adds to the effectiveness. Stale beer or molasses and water with 8 per cent formaldehyde added will probably also give satisfactory results. As far as possible other liquids should be removed when poisoned baits are exposed.

CAUTION.

It should be borne in mind that formaldehyde, 40 per cent, is poison about in the same proportion as wood alcohol, if taken internally. It should not be inhaled, nor should the eyes be unduly exposed to it. Special pains should be taken to prevent children from drinking poisoned baits and to prevent the poisoned flies from dropping into foods or drinks.

PUBLICATIONS OF THE U. S. DEPARTMENT OF AGRICULTURE RELATING TO HOUSEHOLD INSECTS.

AVAILABLE FOR FREE DISTRIBUTION.

Remedies and Preventives Against Mosquitoes. (Farmers' Bulletin 444.)
Some Facts About Malaria. (Farmers' Bulletin 450.)
Sanitary Privy. (Farmers' Bulletin 463.)
Yellow Fever Mosquito. (Farmers' Bulletin 547.)
Carpet Beetle, or "Buffalo Moth." (Farmers' Bulletin 626.)
House Centipede. (Farmers' Bulletin 627.)
Cockroaches. (Farmers' Bulletin 658.)
True Clothes Moths. (Farmers' Bulletin 659.)
House Flies. (Farmers' Bulletin 679.)
Silverfish: An Injurious Household Insect. (Farmers' Bulletin 681.)
Fleas as Pests to Man and Animals, with Suggestions for Their Control. (Farmers' Bulletin 683.)
Hydrocyanic-acid Gas Against Household Insects. (Farmers' Bulletin 699.)
House Ants: Kinds and Methods of Control. (Farmers' Bulletin 740.)
Migratory Habit of Housefly Larvæ as Indicating a Favorable Remedial Measure. An Account of Progress. (Department Bulletin 14.)
A Maggot Trap in Practical Use; An Experiment in House-fly Control. (Department Bulletin 200.)
Further Experiments in Destruction of Fly Larvæ in Horse Manure. (Department Bulletin 245.)
Fleas. (Department Bulletin 248.)

FOR SALE BY THE SUPERINTENDENT OF DOCUMENTS.

Experiments in Destruction of Fly Larvæ in Horse Manure. (Department Bulletin 118.) Price, 10 cents.
Notes on Preoviposition Period of House Fly. (Department Bulletin 345.) Price, 5 cents.
Carpet Beetle, or "Buffalo Moth." (Entomology Circular 5.) Price, 5 cents.
House Ants. (Entomology Circular 34.) Price, 5 cents.
True Clothes Moths. (Entomology Circular 36.) Price, 5 cents.
House Centipede. (Entomology Circular 48.) Price, 5 cents.
Silver Fish. (Entomology Circular 49.) Price, 5 cents.
Cockroaches. (Entomology Circular 51.) Price, 5 cents.
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Notes on Mosquitoes of United States, Giving Some Account of Their Structure and Biology, with Remarks on Remedies. (Entomology Bulletin 25, n. s.) Price, 10 cents.
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House Flies. (Farmers' Bulletin 459.) Price, 5 cents.

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... SPIDER ON COTTON AND HOW TO CONTROL IT.

IMP. BUR.
3 OCT 1916
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By E. A. McGregor,
Entomological Assistant, Southern Field Crop Insect Investigations.

INTRODUCTION.

By the adoption of the preventive measures described in this bulletin it is possible to avoid the losses caused by the so-called red spider (fig. 1), a minute creature which seriously injured 20,000 acres of cotton in South Carolina in 1912, and is similarly destructive in other Southern States. Injury by the red spider in cotton fields may occur from the middle of June until the middle of September. It consists in a rusting and dropping of the leaves and sometimes in the death of the affected plants over considerable portions of the fields. For many years this trouble has been called "rust" by cotton planters, who concluded from the reddening of the leaves that it was a disease. The injury, however, is caused by the presence on the cotton leaves of multitudes of small mites called "red spiders."

GENERAL APPEARANCE AND NATURE OF DAMAGE.

The presence of the pest is first revealed by the appearance on the upper surface of the leaf of a blood-red spot. As leaves become more infested they redden or turn rusty yellow over the entire surface, become folded, then turn brown and dry, and finally drop. The lower leaves usually are first attacked, but infestation spreads upward until often only the bare stalk and one or two terminal leaves remain. (See figs. 2, 3, and 4.) Such plants almost always die.

[1] *Tetranychus telarius* L., generally known as *T. bimaculatus* Harvey, and in some publications as *T. gloveri* Bks.; order Acarina, family Tetranychidae.

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